

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### FISH PASSAGE

(Mi.)

CODE 396

#### DEFINITION

Modification or removal of barriers that restrict or impede movement or migration of fish or other aquatic organisms.

#### PURPOSE

Improve or provide upstream and downstream passage for fish and other aquatic organisms.

#### CONDITIONS WHERE PRACTICE APPLIES

All aquatic habitats where barriers impede passage for fish and other aquatic organisms.

#### CRITERIA

##### Planning and Evaluation

Evaluate sites for variations in stage and discharge, tidal influence, hydraulics, geomorphic impacts, sediment transport and continuity, and organic debris movement. Design passage features to account for the known range of variation resulting from this evaluation.

Minimize any foreseeable channel plan or profile shifts resulting from the modification or removal of a passage barrier.

Plan and locate passage for compatibility with local site conditions and stream geomorphology, to the extent possible. Identify focus fish species, lifestage and seasonal critical use conditions

Avoid locating fishway entrances and exits in areas that will obstruct function, increase harassment or predation, or result in excessive operation and maintenance requirements.

##### Design Requirements

Fish passage design shall follow the

methodology and requirements set forth in the August 2001, Memorandum of Agreement between the Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Transportation and Public Facilities - Design, Permitting, and Construction Of Culverts For Fish Passage (see References) when culverts are a part of fish passage projects.

Design passage to accommodate present and reasonably anticipated changes in watershed conditions.

Design passage structures according to identified swimming and leaping capabilities of focus species or a similar species with comparable swimming abilities. Where project parameters fit within Tier I guidelines of the ADF&G/ AKDOTPF MOA no further hydraulic computations are necessary. For projects outside parameters of Tier I guidance, utilize hydraulic computations to document how designs satisfy the physiological requirements of focus organisms or the guidelines.

Design and evaluate passage structures for hydraulic performance and structural integrity at the bankfull and 50-year peak flow events (at a minimum).

Design passage features to minimize or avoid energy deficits, physical stress, and harm to migratory organisms.

Design passage features to minimize or avoid excessive delays during migration periods.

Provide adequate attraction flow into a passage facility across the full range of discharge during which focus species will move.

Use trashracks on culverts only if required or necessary. Ensure that trashracks are self-cleaning and/or easily maintained.

Select construction materials and methods that are non-toxic, minimize adverse consequences to aquatic organisms, and are resistant to degradation.

## CONSIDERATIONS

Develop or adopt a quantitative method to identify and evaluate passage barriers (see References). Information derived from this method can assist planning and budgeting activities.

Consider removing a passage barrier before installing or retrofitting a new facility or structure. Complete or partial barrier removal usually provides better passage conditions, and is more economical than designing, constructing, operating, and maintaining many passage structures.

Culverts or bottomless arches that incorporate natural streambed substrates throughout their length are preferred over other culvert configurations for passage purposes. Natural streambeds provide numerous passage and habitat benefits to many life stage requirements for fish and other aquatic organisms compared to man-made surfaces.

Design and locate features to improve or provide passage for as many different aquatic species and age classes as possible.

Replacing or removing an existing instream structure may trigger channel adjustments (e.g., aggradation and/or degradation) upstream and/or downstream of the work site. Install grade controls or other slope modifications to mitigate adverse physical or ecological consequences (see Channel Stabilization – Code 584 and Grade Stabilization Structure – Code 410).

Analyze any potentially negative interactions, including hybridization, disease, competition, or predation, between target and aquatic nuisance species when passage is provided above a barrier. If serious consequences are likely, take steps to minimize adverse effects.

Where possible, consider the habitat requirements of other aquatic or terrestrial species that may be affected by a passage project. Some passage facilities may improve survival for terrestrial vertebrates by providing safe migration routes under roadways.

Consider the amount of habitat upstream and downstream of a barrier to evaluate into project feasibility, cost effectiveness, and/or potential for connecting fragmented habitats. Using a watershed approach whenever possible provides a framework for project planning.

Fish passage facilities are often associated with water diversions or intakes that injure or kill aquatic species. Prevent fish entrainment, particularly juveniles, into diversions, penstocks, or pumps by installing screens.

Passage projects can affect water management practices such as diversion, power generation, or storage. Strive to balance aquatic organism passage with other water management objectives.

Consider upstream and larger watershed issues that may affect passage. Common solutions may include maintaining or restoring adequate instream flow and/or other water quality parameters (e.g., temperature, dissolved oxygen).

Barrier removal, especially dams and road crossings, can significantly affect wetlands, flooding potential, existing infrastructure, and social and cultural practices. Evaluate and address the full range of impacts when planning or designing barrier removal projects.

Floodplain and water development often alter historic river channel pattern and location. Consider bypassing a barrier by restoring streamflow to former, stable natural channels.

Passage facilities can assist population recovery and management. Where applicable, consider local, state, or federal brood stock collection and species management initiatives when planning passage features.

Consider using self-regulating tidegates in marine environments. These structures can be adjusted to automatically regulate saltwater intrusion into estuaries, and often improve estuarine functions and passage conditions.

In the case of low-water crossings, water quality impacts from vehicular pollutants and erosion caused by tire action can be severe. Where possible, reroute roadways or install hardened instream crossings.

## PLANS AND SPECIFICATIONS

Provide site-specific plans for this practice. Plans will specify passage structure design, layout, and overall objectives, and include (at a minimum):

- Location map and plan view of site;
- Alaska Conservation Practice Job Sheet for 396 Fish Passage;
- Alaska 396 Fish Passage checklist;
- Detailed construction drawings showing site elevations (including headwater and tailwater fluctuations), description and analyses of design flows, and structural operating criteria;
- Construction specifications describing materials, logistics (including erosion control), and timing;
- Guidance for post-construction evaluation and monitoring to assess structural integrity and compliance with design criteria.

## OPERATION AND MAINTENANCE

Develop an operation and maintenance plan for all applications of this standard. Within the plan, provide for periodic inspection and corrective action should passage conditions become impaired because a structure is damaged or inoperable. Typical operation and maintenance items include:

- Specify what entity is responsible for the daily operation and maintenance of a passage structure.
- Check a passage structure at regular intervals to ensure it is operating within design criteria.
- Clean trashracks and debris collectors or remove debris accumulations regularly.
- Adjust gates, orifices, valves, or other control devices as needed to regulate flow and maintain a passage structure within operating criteria.
- Periodically check staff gages or other flow metering devices for accuracy.
- Annually inspect passage structures for structural integrity and disrepair.

- Inspect gate and valve seals for damage.
- Replace worn or broken stoplogs, baffles, fins, or other structural components.
- Remove sediment accumulations from within passage structure where applicable.

## REFERENCES

Alaska Department Of Natural Resources – Office of Habitat Management and Permitting; [Bridge or Culvert Construction and Maintenance](#)

MOA between Alaska Department of Fish and Game (ADF&G) and Department of Transportation and Public Facilities; August, 2001 [Design, Permitting and Construction of Culverts for Fish Passage](#)

[Fundamentals Of Culvert Design for Passage Of Weak-Swimming Fishes](#) – Final Report No. FHWA-AK-RD-90-10; Charles E. Behlke (et al) and Douglas Kane; Water Research Institute of Northern Engineering, University Of Fairbanks, AK

[FISHPASS](#) Model program to calculate fish passage requirements for culvert installations. FISHPASS program software documentation.

Bridge or culvert installation and maintenance activities in Alaska fish-bearing waterbodies require a [Fish Habitat Permit](#).

Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fish - <http://www.adfg.alaska.gov/sf/SARR/AWC/index.cfm?ADFG=main.overview>.

[FishXing](#) – Software and learning for fish passage at culverts. USDA-USFS

[Aquatic Nuisance Species Information](#). 2006. (per Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 [16 U.S.C. 4701]).

NRCS. 2006. Fish passage and screening designs. Technical Supplement 14-N to NEH-654 – Stream Restoration Design Handbook.

*Streambank, Revegetation and Protection, Guide for Alaska, 2006*, <http://www.adfg.alaska.gov/index.cfm?adfg=streambankprotection.how> Alaska Department of Fish and Game

[Stream Corridor Restoration, Principles, Processes, and Practices](#), The Federal Interagency Stream Restoration Working Group, 1998